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2009 ASME International Mechanical Engineering Congress and Exposition, IMECE2009; Lake Buena Vista, FL; 13 November 2009 through 19 November 2009; Code 80879**Preliminary study of fire spread in cities and forests, using pmma specimen as a fuel in cfd simulations**[Satoh, K.](#)^a , [Qiong, L.](#)^a , [Naian, L.](#)^a , [Yang, K.T.](#)^b ^a State Key Laboratory of Fire Science, University of Science and Technology of China, Hefei, Anhui 230026, China^b Department of Aerospace and Engineering, University of Notre Dame, Indiana 46556, United States**Abstract**

It is important to examine the behavior of forest fires and city fires to mitigate the property damages and victims by fires. There have been many previous studies on forest fires where the fire spreading patterns were investigated, utilizing artificial satellite pictures of forest fires, together with the use of corresponding weather data and GIS data. On the other hand, large area city fires are very scarce in the world, particularly in modern cities where high-rise concrete buildings are constructed with sufficient open spaces. Thus, the examples of city fires to be referred are few and detailed investigations of city fires are limited. However, there have still been existing old cities where traditional houses built with flammable material such as wood, maybe historically important, only separated with very small open spacing. Fires may freely spread in those cities, once a big

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earthquake happens there and then water supply for the fire brigade is damaged in the worst case along with the effect of strong wind. There are some fundamental differences between the forest fires and city fires, as the fuel may distribute either continuously or discretely. For instance, in forest fires, the dead fallen leaves, dry grasses and trees are distributed continuously on the ground, while the wooden houses in cities are discretely distributed with some separation of open spacing, such as roads and gardens. Therefore, the wooden houses neighboring the burning houses with some separation are heated by radiation and flames to elevate the temperatures, thus causing the ignition, and finally reaching a large city fire. The authors have studied the forest fire spread and are planning to start a laboratory experiment of city fire spreading. In the preliminary investigation, a numerical study is made to correlate with the laboratory experiment of city fire propagation, utilizing the three-dimensional CFD simulations. Based on the detailed experimental analysis, the authors are attempting to modify the three dimensional CFD code to predict the forest fires and city fires more precisely, taking into account the thermal heating and ignition processes. In this study, some fundamental information on the city fire propagation has been obtained, particularly to know the safe open spacing distances between the houses in the cities and also the wind speed. Copyright © 2010 by ASME.



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